Prediction of functional outcome following spontaneous intracerebral hemorrhage in adults: a proposed grading system.

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Objectives: To describe and quantify the effects of admission characteristics on mortality and functional outcome. A grading scale is proposed to aid in prediction of prognosis.

Background: Spontaneous intracerebral hemorrhage due to hypertension or amyloid angiopathy remains a significant cause of death and disability. The proposed grading scale may prove useful in evaluating the effectiveness of various treatment regimens, by allowing physicians to compare patients with similar predicted outcomes.

Materials and Methods: A retrospective chart review of 163 patients admitted with a diagnosis of intracerebral hemorrhage between the years of 1996 and 2000 was undertaken. Patients with head trauma or lesions such as tumors or vascular anomalies were excluded, leaving 150 subjects for this study. Logistic regression was used to determine odds of either death or poor prognosis with respect to various admission characteristics. 30-day outcomes were divided into three groups based upon the Glasgow Outcome Scale (GOS): dead (GOS 1), poor outcome (GOS 2 and GOS 3), and good outcome (GOS 4 and GOS 5). Finally, a grading scale is proposed to help predict outcome. Using strength of association, points were assigned to predictive factors as follows: age$\geq$80 (1 point), admission Glasgow Coma Scale (GCS)$\leq$8 (2 points), admission GCS 9-12 (1 point), hematoma volume $\geq 30cc^3$ (2 points), presence of intraventricular hemorrhage (2 points), brainstem location (2 points) and supratentorial location (1 point). Percentages of patients with death, good and poor outcomes were then calculated for each grade.

Results: Independent predictors of 30-day mortality included: age$\geq$80 (p=0.042), admission GCS$\leq$8 (p=0.007), volume of hematoma $\geq 30cc^3$ (p=0.007), and presence of intraventricular hemorrhage (p=0.015). The only independent predictor of 30-day poor outcome was admission GCS$\leq$12 (p<0.007). Gender, presence of midline shift, mean arterial pressure at admission, and laterality of the lesion were not significant independent predictors of mortality or functional outcome. Location of hemorrhage was also correlated with outcome, though was not significant as an independent predictor. The proposed grading scale was well correlated with functional outcome at 30 days. Patients with 0 points had no mortality, and 75% had a good outcome. Patients with 8 points had an 85.71% mortality rate, and 0% had a good outcome.

Conclusions: Age, admission GCS, hematoma volume, and presence of intraventricular hemorrhage are independent predictors of both mortality and functional outcome in spontaneous intracerebral hemorrhage. Location of hemorrhage is correlated with outcome, though is not independently significant. The proposed grading scale may effective in predicting mortality and functional outcome.

Questions for consideration:

1.   What are some ways to deal with a three-level outcome? [In this study, good outcome, poor outcome, death.]

2.   Can I use a propensity score to adjust for those patients who underwent some surgical intervention in this study? How?

3.   How can I assess the ability of the grading scale to predict outcome? Simple correlation, ROC curve?

4.   How would I go about validating the grading scale on a second set of patients?